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THE DESIGN OF THE BUILDING RENTAL INFORMATION SYSTEM USES THE PROTOTYPE METHOD

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Abstract
Currently, most of the building leasing is done manually; that is, the activities from ordering to leasing must be done at the office where the building is leased. In the ordering process, the clerk records all the ordering data in the book. The problem that often occurs is that office staff need time to view customer data and see the building schedule used. The second problem occurs to consumers. Consumers have to come to the office to see the building and place an order, so it takes a long time; with this problem, a building rental information system is needed to make it easier for the community. The method used in designing this information system uses the prototype method and software testing using a black box with the help of maze design for testing correspondents; with the design of this building, the rental information system can run effectively and efficiently and help people find and rent buildings. The result of this research is that the building rental information system design can be designed with a prototype method supported by creating a user interface from the proposed application.

1.0 INTRODUCTION

Humans no longer build buildings only for living quarters, but humans build buildings for offices, places of worship, and others. Besides that, multi-functional buildings can be used for wedding receptions, tournaments, seminars, concerts, sports, and others. This shows that the building is used by the owner and can be used by the general public for various activities by renting the building according to their needs. Currently, most of the building leasing system is still done manually; that is, the activities from ordering to leasing must be done at the office where the building is leased. In the ordering process, the clerk records all the ordering data in the book. The problem that often occurs is that office staff need time to view customer data and see the building schedule used. The second problem is that consumers have to come to the office to see the building and place an order, so it takes a long time [1]. Therefore, to make it easier for building business owners and consumers to order buildings, a system is needed to place orders online, which can be beneficial for consumers and business owners.

The system design method that has been used in making previous rental system designs such as waterfall has weaknesses that can take a lot of time, and the development process is relatively long because it is done in stages and cannot carry out other stages before the next stage is complete. Also, the Agile method has been used to design rental systems, the weakness of this method is analysis, design, and development which is difficult to predict, besides that the weakness of the agile method is the lack of documentation which can increase the risk of miss-communication [2]. The design of this building rental system is made with a prototype system development method. It uses an object-oriented approach using UML

(Unified Modeling Language) to design the system to be created. The advantages of the prototype method in designing this building lease are because the system development is very fast and can save time, and it will be suitable for use in the system to be made. In previous research, several journals discussed the design of a web-based building rental information system. Among others are:

The research conducted by Karlina entitled "Design and Build a Web-Based Wedding Organizer Salon Arjuna Srikandi Service Procurement System" focuses more on users who have a plan in the implementation of a series of wedding events. This research was conducted by using the prototyping method. This research focuses on systems. Meanwhile, what distinguishes their research from others is the design method used [3]. Research conducted by Hanna Lusti, Fajar Masya, entitled "Analysis of the Design of a Web-Based Wedding Organizer for a Web-Based Wedding Organizer (Case Study: JFS Wedding Organizer Cakung)." This research focuses on designing a website-based wedding planner website. Meanwhile, what distinguishes this research from others is the method used in this study using literature study methods, data collection, and system design using UML modelling [4]. Research conducted by Fitasari Wiharni, Yuli Adam Prasetyo, Taufik Nur Adi entitled "Development of Auction Module at Siapsiapnikah.com Using Extreme Programming Methods and Crowdsourcing Concepts." This research focuses on developing an auction system module to assist customers in finding the most appropriate price of the lot—wedding organizer choice. Meanwhile, what distinguishes this research from others in developing this system using the crowdsourcing concept and the Extreme programming research method [5]. Research conducted by I Dewa Ayu Eka Yuliani, Sandy Kosasi entitled "Decision Support System for Wedding Organizer Selection". This research focuses on making a decision support system in choosing a wedding organizer. This study uses the analytical hierarchy process (AHP) method. The decision-making process is carried out by assessing the choices based on criteria that the user has determined [6].

Research conducted by Jajang Sofian, Hanhan Hanafiah Solihin, entitled "M-Wedding Application Development as a Wedding Organizer Business Socialization". This research focuses on developing a Mobile Wedding application using the prototype method. Meanwhile, what distinguishes this research from others is that the development of the M-Wedding application only provides information related to wedding organizers in certain areas [7]. Research conducted by Rolly Yesputra and Cecep Mulyana entitled "Using Prototyping Methods to Develop The Information System For Academic Advisors". This study focuses on developing an academic information system to conduct consultations between students and supervisors. This system can be used online. This system can record student activities such as making daily, monthly, and annual reports. This educational supervisor information system is made using the prototyping method. With this information system, it is easier for academic supervisors to monitor students [8].

Research conducted by Radka Nacheva entitled "Prototyping Approach in User Interface Development". This study focuses on discussing the prototyping method process as problem-solving and refers to the process approach. Meanwhile, this research distinguishes this research because this research proposes a prototyping approach in user interface development based on an evolutionary prototyping approach and a process approach [9]. Research conducted by Dirk Baumer, Walter R, Horst Lichter, and Heinz Zullighoven entitled "User Interface Prototyping – Concepts, Tools, and Experience". This study discusses the basic concepts in user interface prototyping, classification of supported tools, and case studies of 9 major industrial projects. Meanwhile, this research distinguishes this research because this research explains that the prototype method is increasingly being used as a vehicle to develop and demonstrate an innovative system vision [10]. Research conducted by SA Asri, Inga Astawa, Igam Sunaya, Ka Yasa, Ine Indrayana, and W Setiawan entitled "Implementation of Prototyping Method on Smart Village". This research focuses on the development of smart village applications using the prototype method. Meanwhile, this research distinguishes this research because this research builds a smart village application that requires many communities from rural communities with diverse cultures and educational backgrounds [11].

Research conducted by Youn-Kyung Lim and Josh Tenenberg entitled "The Anatomy of Prototypes: Prototypes as Filters, Prototype as Manifestations of Design Ideas". This study focuses on discussing the anatomy of the prototype as a framework for conceptualizing the prototype. The difference between this research and others is that this framework has two main dimensions, namely, prototype as a filter and prototype as manifestation [12]. Research conducted by Ratnmala R. Raval and Haresh M. Rathod entitled "Comperative Study of

Various Process Models in Software Development". This research focuses on discussing comparative studies of various process models in software development based on parameters. It includes various factors for choosing a software model in software development [13]. Research conducted by Dr. June Verner and Mahil Carr entitled "Prototyping and Software Development Approaches". This study focuses on discussing the classification of software development approaches that include several types of prototypes. In this discussion, researchers review experimental prototyping, exploratory prototyping, and evolutionary development [14]. Research conducted by Lei Xue and Suyun Luo entitled "The Design and Realization of Vehicle Rent Information System Based on Java". This research focuses on developing a network-based car rental management system conducive to increasing the company's operational capacity to meet the needs of industrial development. The development tools used in the construction of this system are MyEclips, Mysql as a database, Macromedia Dreamweaver as a design tool, and the Java programming language [15].

2.0 THEORETICAL

2.1. Usability Testing

Usability testing is a method of performing utility evaluation. The user can participate directly; the user is invited to perform a task on a particular product. Their behavior is observed and recorded to identify deficiencies in the design that cause errors or difficulties for the user. Once identified, design recommendations will be proposed to improve product quality [16].

2.2 Prototype Modeling

The prototype is a system design based on the final system to be built. Prototyping allows users to interact with the system early in the development process and helps them understand and clarify what the system needs. Prototype requirements and specifications are improved and modified as users and technicians interact with the prototype. Because users are involved during all phases of development [17].

3.0 METHODOLOGY

This research was conducted with the prototype method. This method is one of the software development methods used to demonstrate concepts, design experiments, and find more problems and possible solutions. The prototype method used in this study aims to get an overview of the application built through the design and then evaluated by the user. The prototype application that has been evaluated will then be used as a reference for making applications that will be used as the final product as the output of this research [18]. The stages of the prototype method for designing this system are as follows:

1. ***Collection of needs***
   Requirement's collection begins with a detailed analysis of defined system requirements. After the requirements are known, the initial system design will be made, but the initial design of this system only includes aspects of the system that provide an overview of the system.
2. **Build a prototype**
   Requirement's information that has been collected from the initial design will then be converted into the prototype that displays the working model of the required system.
3. **Evaluation of the prototype**
   Furthermore, the prototype that has been made will be thoroughly evaluated to see its strengths and weaknesses. The results of this evaluation will be used as input to the system in the prototype repair process

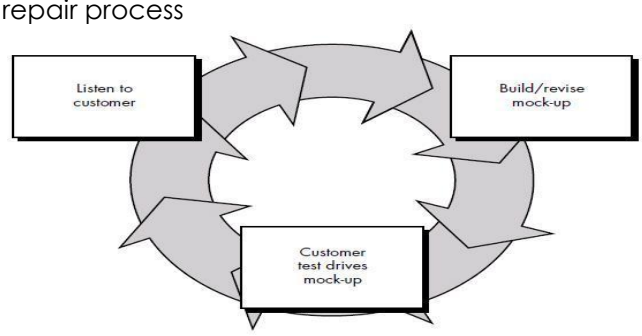

Figure 1. Prototype Method

Also, this study uses an object-oriented approach using UML (Unified Modeling Language) as a tool that will be used in designing the system to be created [19].

4.0 RESULTS AND DISCUSSION

4.1. Collection of needs

Analysis of system requirements describes the conditions or capabilities of the system to be made by the specifications desired by the user.

Functionally, the building rental system to be built must meet the needs of the user, including:

- The system built must help the work of building owners and customers in the rental process
- The system built must be able to make transactions online.
- The system built must be operated by all people and the registered building owner's business.
- The system built must store customer data, build business owner data, and user password data.
- The system built must generate order reports and income reports for business owners daily, monthly, and annual reports.
- All existing data processing processes must be integrated into one application, and all processed data must be stored in one center.

In non-functional, the supporting devices in this building rental system have a software system and a hardware system; this supporting device is a unit that can support a running system so that it can produce output as expected.

Software (Software)

The software requirements specifications required are as follows:

- ✓ Windows 10 Operating System
- ✓ Web browser applications such as Google Chrome and Mozilla Firefox.
- ✓ Figma
- ✓ Maze Design

Hardware (Hardware)

The specifications of the hardware requirements required are as follows:

- ✓ Processor: 2.0 GHz minimum capacity
- ✓ Memory: 2 Gb minimum
- ✓ Hard drive: minimum capacity of 100 Gb.

System Overview

This building rental website was built to make it easier for people to search and rent buildings quickly and precisely. Customers can see the types of building types rented from various places, building support facilities, price lists, and customers can also rent buildings from far in advance. Also, building business owners can advertise buildings for rent, making it easier for managers to record orders and as a new promotional medium that can get more customers from various regions. The system architecture consists of 3 users, namely the building business owner who manages online rental, the customer as a user who wants to find buildings to rent, and the admin to manage this online building rental website.

4.2. Build a prototype

a. Use Case Diagram

The use case diagram of the building rental information system that will be made has three actors, namely Admin, business owner, and customer:

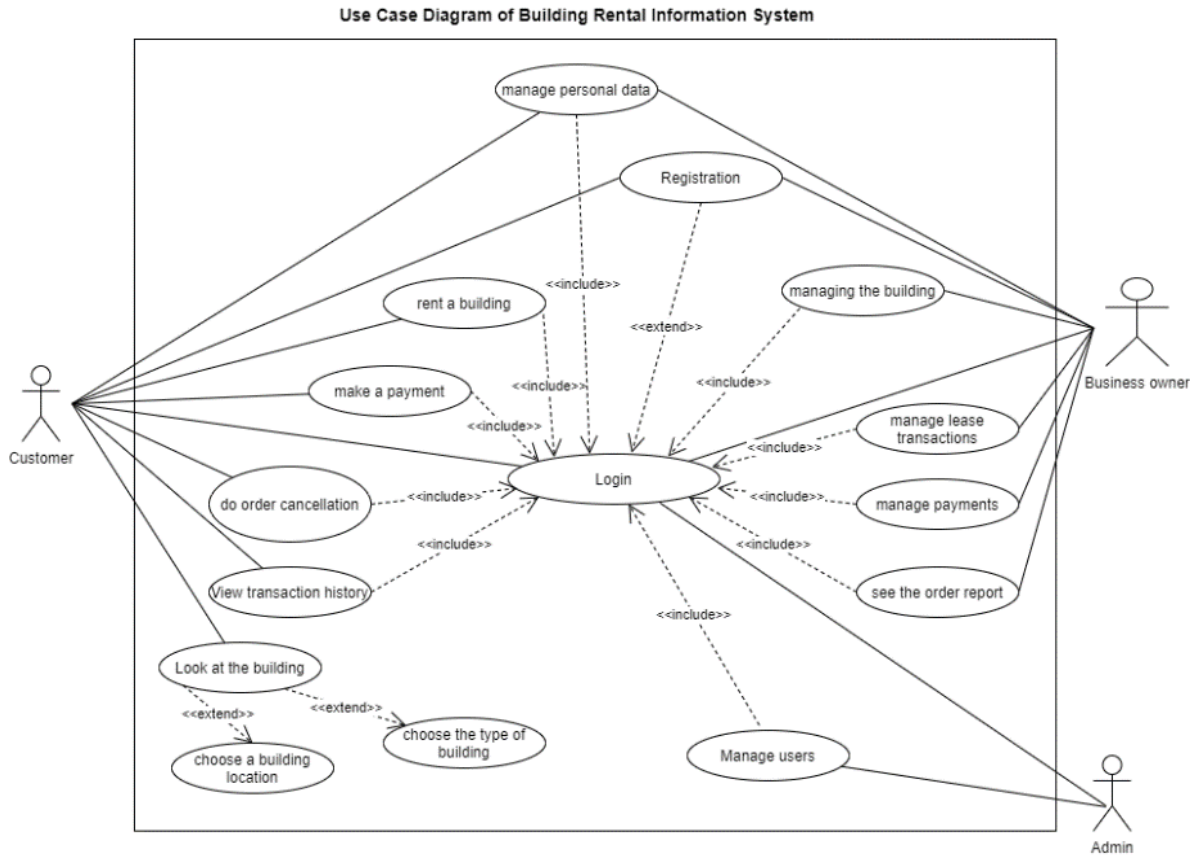

Figure 2. Use Case Diagram

In the use case diagram above, there are three actors and have the following tasks:

1. The customer actor has several tasks, including:
   - log in to the system
   - do registration
   - manage personal data
   - make building rentals
   - make a payment
   - make an order
   - View transaction history, and
   - View the building
2. Business owner actors have several duties, including:
   - do registration
   - log in to the system
   - Manage personal data
   - Manage building ads
   - Manage rental transactions
   - Manage payments, and
   - View order report data
3. The admin actor has several tasks, including:
   - log in to the system, and
   - perform user management

a. Activity Diagram

The activity diagram of this building rental system illustrates the workflow that contains each system's activity to be created.

1. Rental activity diagram

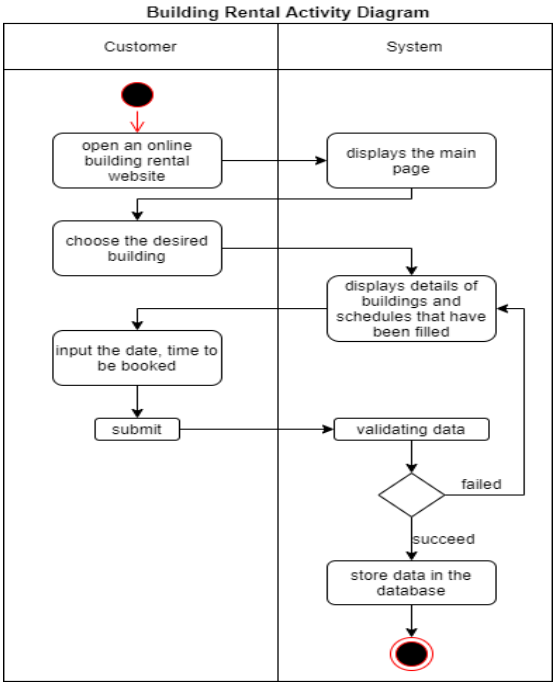

Figure 3. Rental activity diagram

The activity diagram above describes the workflow activities carried out by the customer when renting a building. The activities carried out by the customer are as follows:

- When the customer opens the building rental website, the system will process the request from the customer, and the system will display the main page of the online building rental website.
- Then, the customer can choose the building to be rented, and the system will display the details of the building that the customer has selected.
- The customer then rents the building by inputting complete data according to the form provided.
- After all the running processes are declared correct, the data will be added, and the system will store the order data in the database.
- If the input entered is incorrect or invalid, the system will automatically display the building detail page so that the customer is required to select and re-enter the order data.

b. Activity diagram of building management

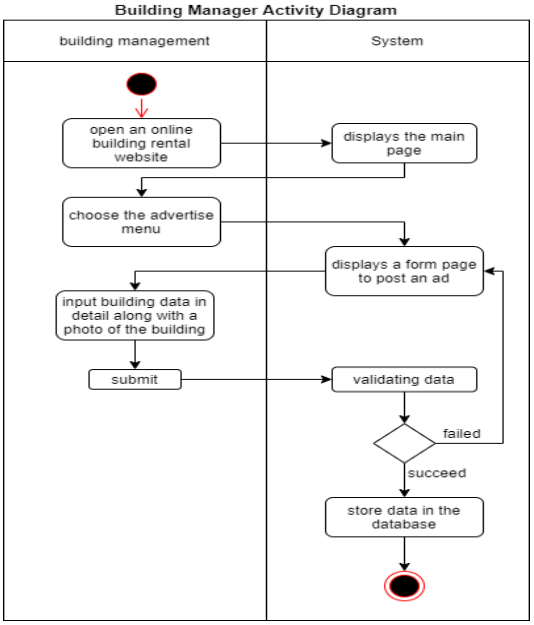

Figure 4. Activity diagram of building management

The activity diagram above describes the workflow activities carried out by building managers when placing building advertisements. The activities carried out by building managers are as follows:

- When the building manager opens the building rental website, the system will process the request from the manager, and the system will display the main page of the online building rental website.
- Then, the building manager can select the advertising page menu to place an advertisement for the building. The system will process the request from the manager, and the system will display the advertisement form page.
- The manager then inputs complete data according to the form provided.
- After all the running processes are declared correct, the data will be added, and the system will store the order data in the database.
- If the input entered is incorrect or invalid, the system will automatically display the advertisement input form page so that the manager is required to re-enter detailed data.

c. Sequence Diagram

This sequence diagram illustrates the interaction between objects in the building rental information system to be made.

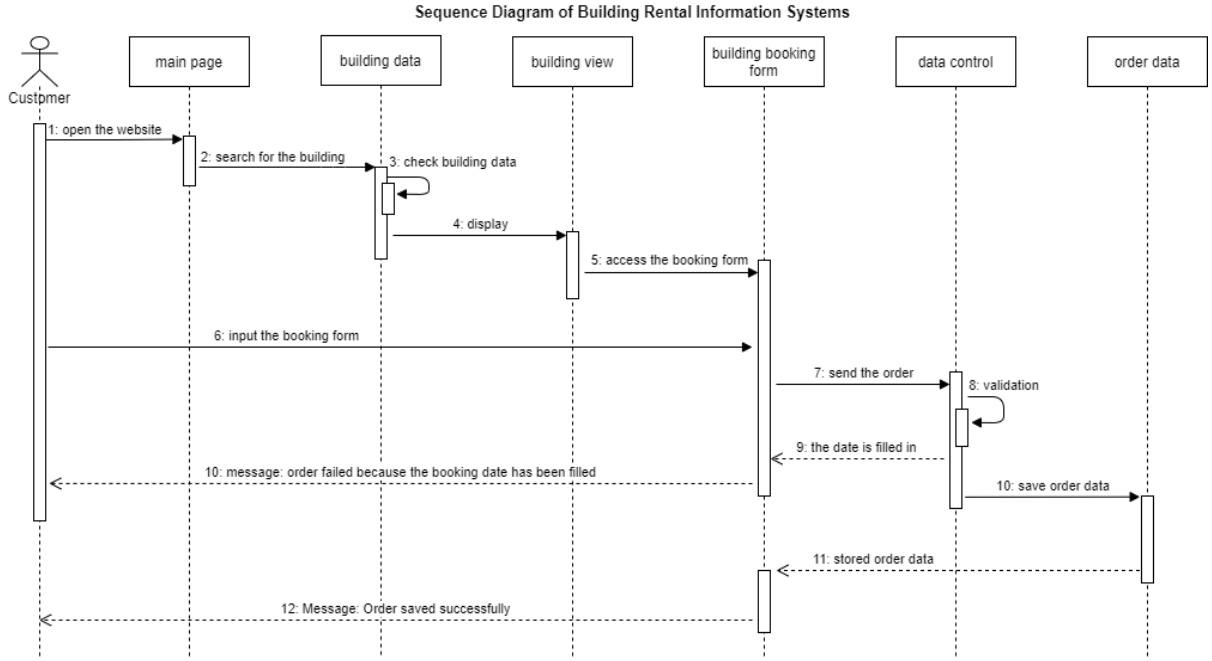

Figure 5. Sequence Diagram

The Sequence diagram above explains the interactions between objects made by customers when renting a building. The diagram shows one user and six objects: main page, building data, building view, building booking form, data control, and order data. First, the customer enters the initial page view by opening the website from an online building rental. After the customer selects a building, the system will check the available building data and display the building page's details to the customer. When going to rent a building, the customer goes to the order page and inputs the order form in detail. After the customer sends the order, the system will validate via data control. The order is successfully saved when all form data inputted by the customer is valid. When the system validates the order and fails, the system will give a notification to the customer to re-enter the order data.

d. Database Design

The database design in this building rental information system describes the relationship flow between the tables in the system to be created. This database design consists of 6 tables that are interconnected between tables to become a unified system that runs.

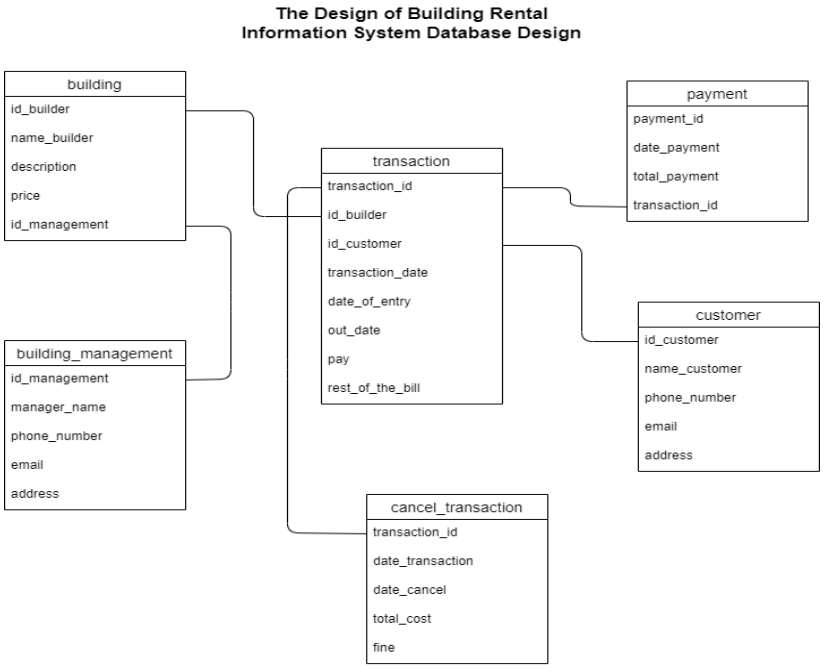

Figure 6. Database Design

e. User Interface Design

The user interface design in this building rental information system illustrates the website design that will be made. This user interface design has five pages: the main page, login page, building detail page, rental page, and advertising page. The following is an online building rental user interface design.

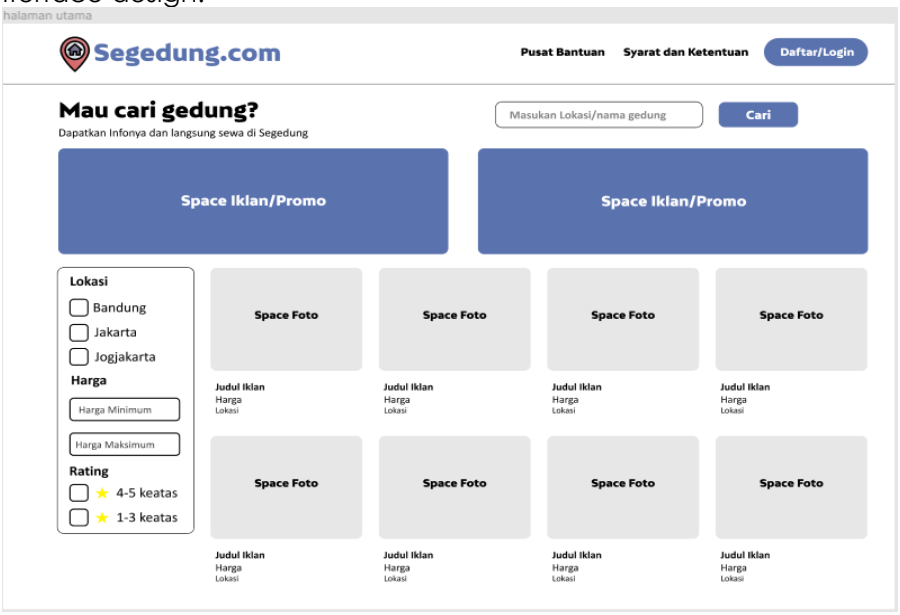

Figure 7. Main Page

Figure 8. Login Page

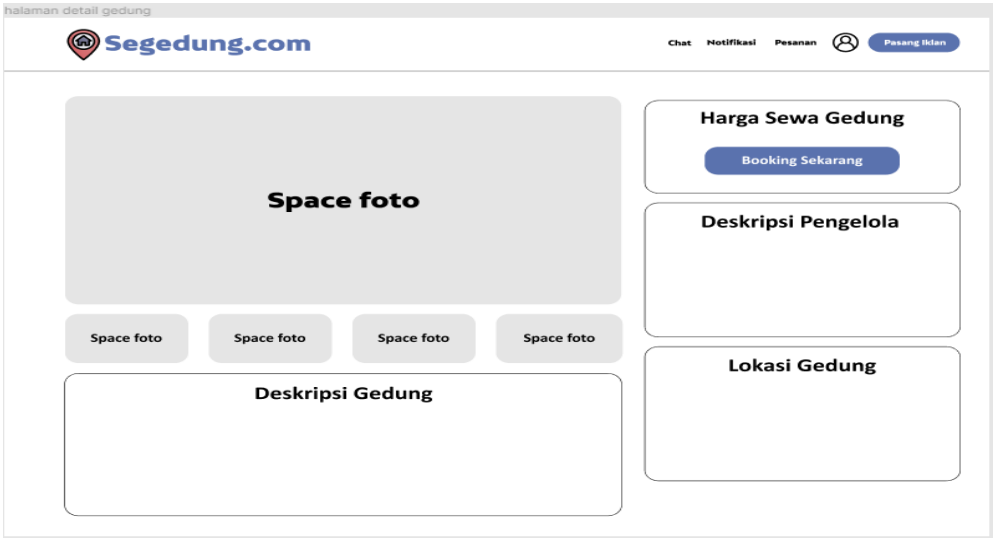

Figure 9. Building description Page

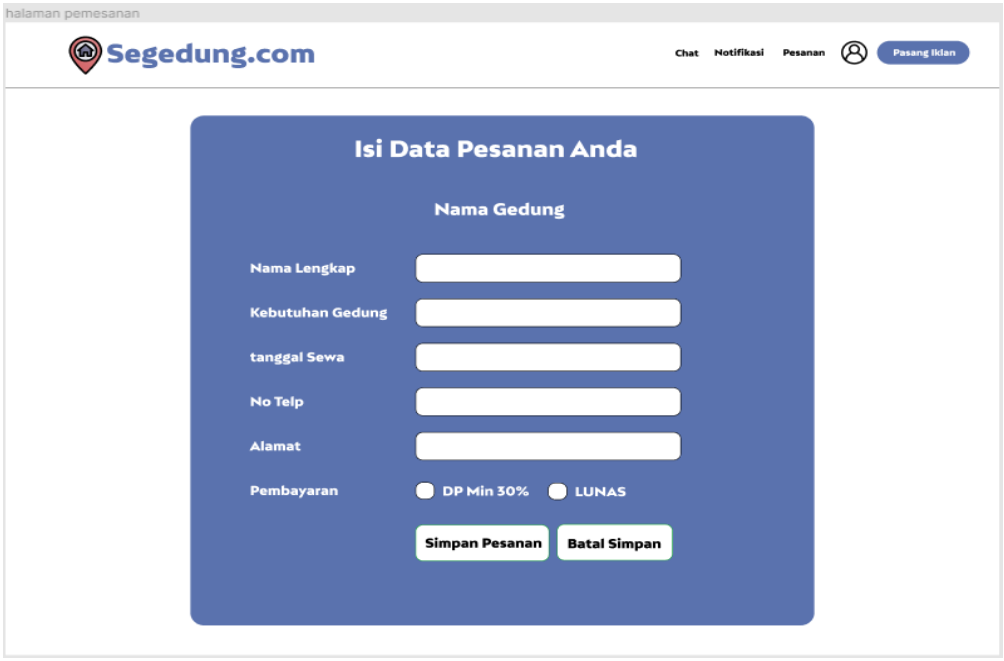

Figure 10. Rental Page

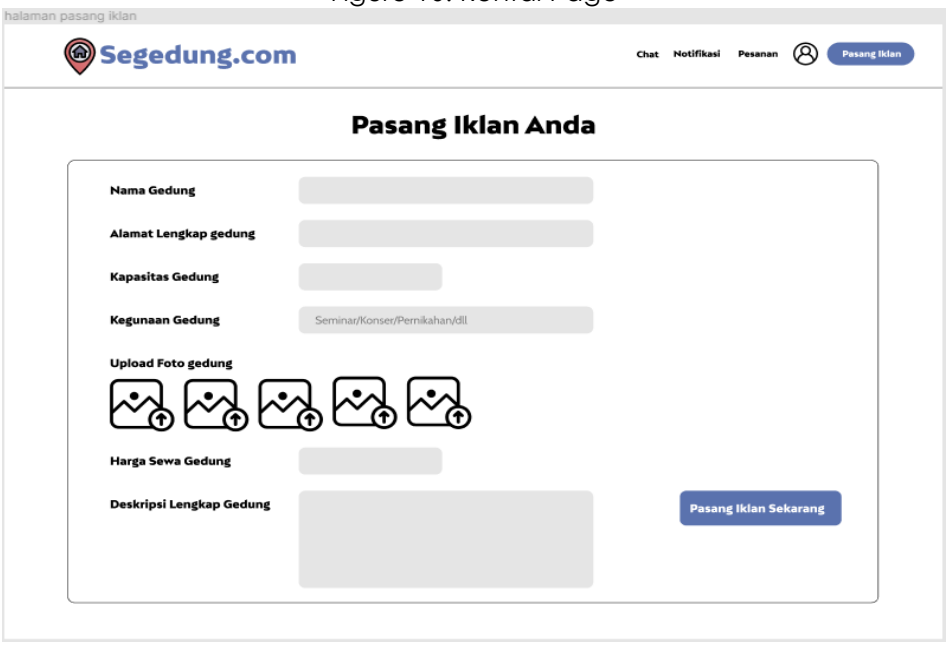

Figure 11. Advertising Page

4.3. Evaluation of prototype

Testing the building rental information system using the black box method, this black box testing focuses on the functional requirements of the software being made. This test aims to ensure that the software created has reliable quality and can provide a specification review, analysis, and design of the devices that have been made. The test was carried out for one week and collected six correspondents who gave comments and assessments of the interface design on the application prototype "SEGEDUNG". In testing this building rental information system using maze design software. Maze design is used to do usability testing online. The use of the maze design application can help to get heatmaps and clicks. The procedure for using this maze design is by entering the prototype link that has been made and then distributing the test link to the public. Participants consist of people who need information on building rentals. The following results from the report:

a. Asked about the difficulty of finding and renting a building

In this testing session, respondents were asked questions about the difficulty of finding and renting a building; this question aims to find out how many respondents still need a building search application.

Figure 12. Yes or No Question

b. Login page

In this session, correspondents are asked to press the login button to enter the main menu. Based on the figure, we can see in the Heatmap that 100% of the correspondent missed clicking the button, and the average time for this session was 7.2 seconds.

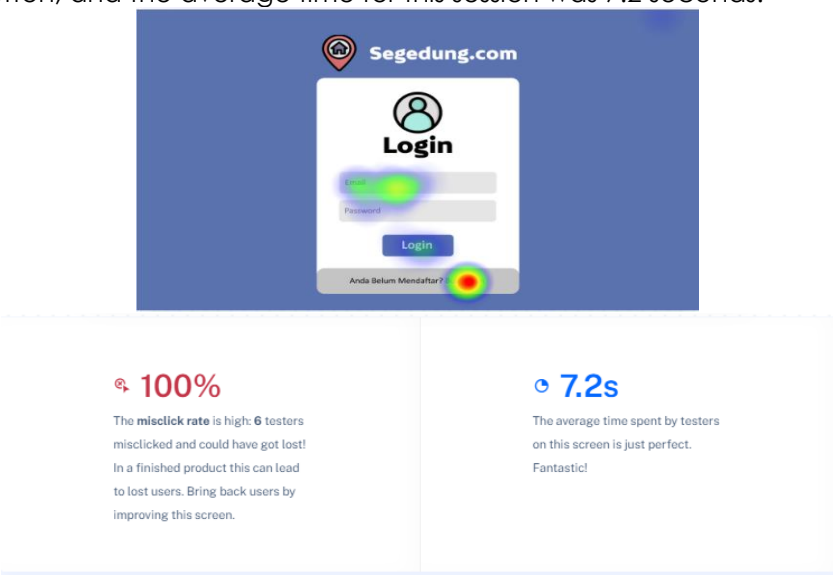

Figure 13. Testing User Interface Login Page

c. Main page

In this session, the correspondent is asked to press one of the available advertisements to enter the building details page. The test results show that about 33% of correspondents miss click, and the time it takes to complete is 9.3 seconds.

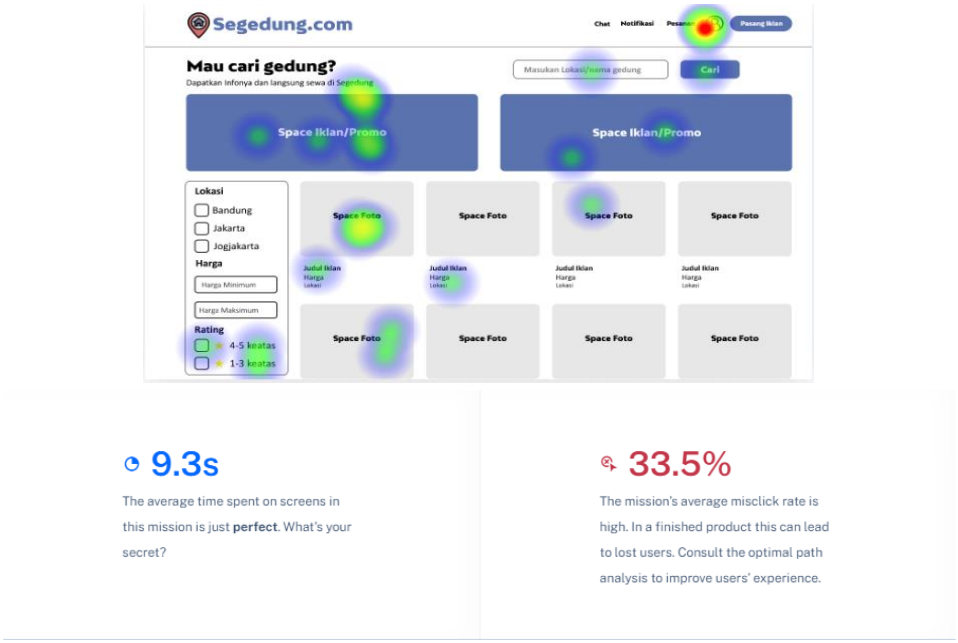

Figure 14. Testing User Interface Main Page

d. lease a building

In this session, the correspondent is asked to rent a building by pressing the text button "Book Now" to enter the order form page and then press the "Save Order" button to process the leased building. The test results show that about 10% of the correspondents miss click, and the time it takes to complete is 6.2 seconds.

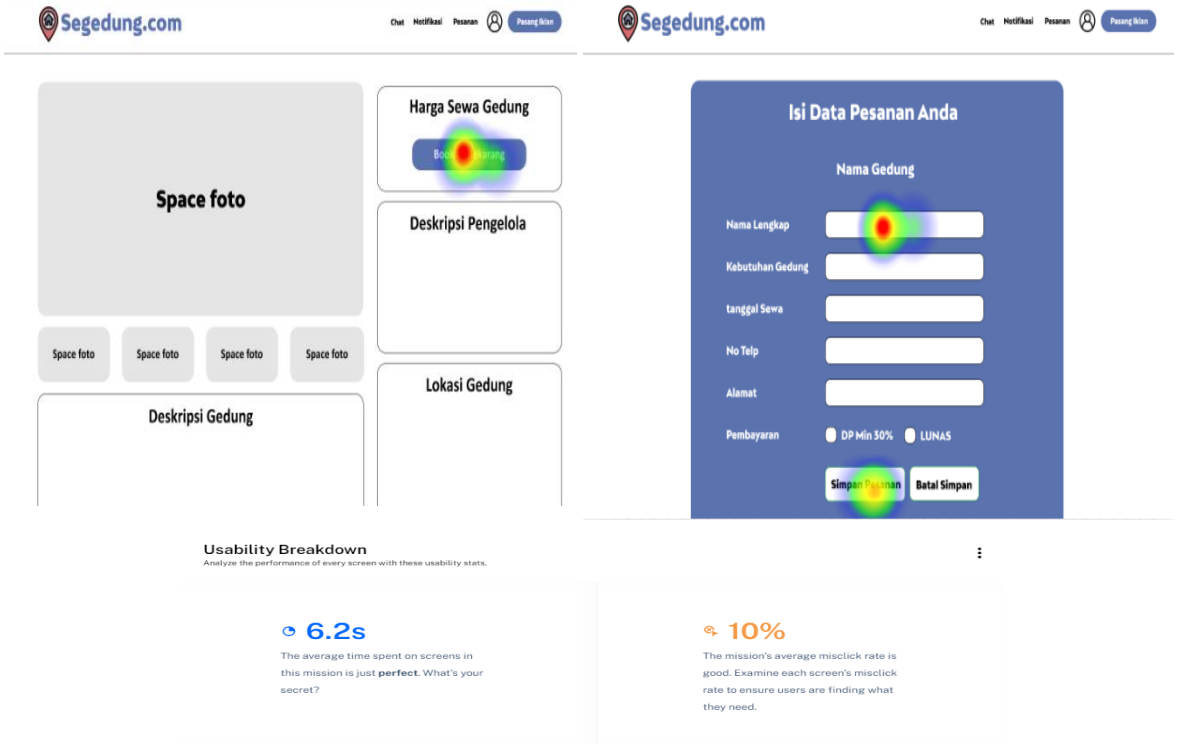

Figure 15. Testing User Interface lease a building

e. Advertising

In this session, correspondents were asked to place an advertisement for a building by pressing the text button "Post an Ad" to enter the advert form page, then press the "Post an Ad now" button so that the building ad appears on the main page of "SEGEDUNG". The test results show that about 25% of correspondents miss click, and the time it takes to complete is 8.3 seconds.

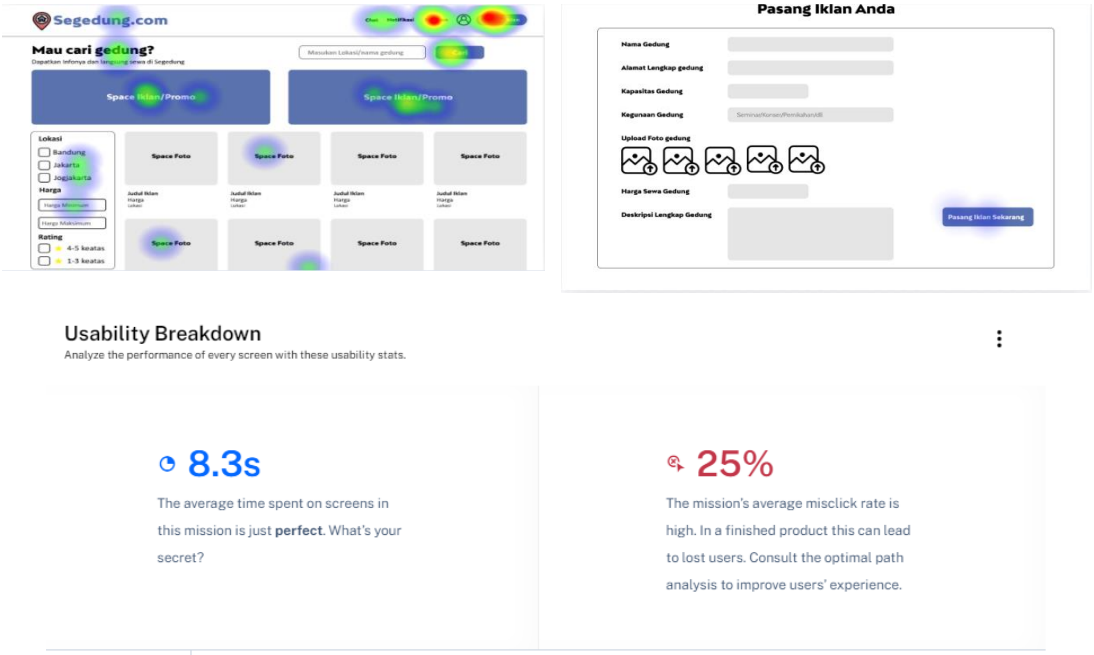

Figure16. Testing User Interface Advertising

5.0 CONCLUSION

5.1. Conclusion

This study concludes that the design of this building rental information system can be designed with a prototype method which is supported by the creation of a user interface from the proposed application, and based on the test results above, several things need to be considered in making the prototype user interface and still need some improvements and additions—information from customers for further development. In this research, it is only until the design of the information system is made that, to carry out further development, this design can be continued to the coding stage of the system so that it can become a ready-to-use application. In addition, this research will benefit the wider community, who will build a similar system with the development of a better system and increasingly developing technology. The following conclusion is that an online building rental information system can make it easier for people to find buildings and make transactions online. In addition, this system can be a new promotional medium for business actors; besides that, this system can make it easier for building businesses to process transactions and record orders.

5.2. Suggestion

This application still needs a lot of development to be more interactive by adding various kinds of advanced features such as the basket feature and the building package features provided for the customer.

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